

# EIC Tracking Simulation Studies

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eRD6 Meeting

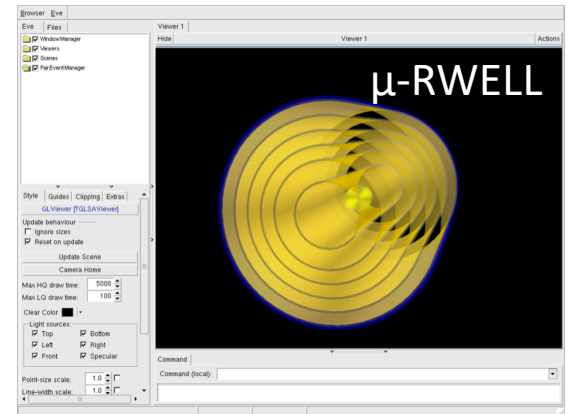
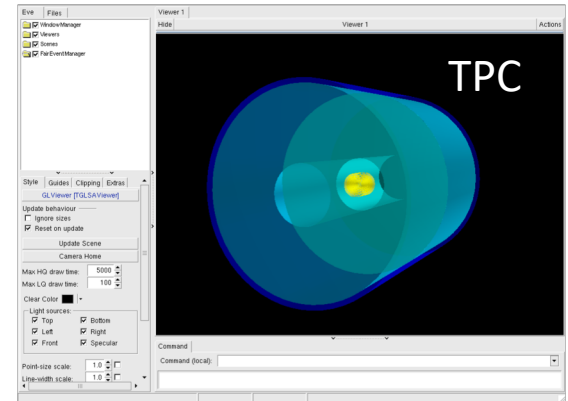
# Tracking Study

Determining the resolution of tracking by comparing the track parameterizations near where the DIRC would be (approximated to be at the edge of the tracker  $\sim 81\text{cm}$ ), to the true Monte Carlo track parameters at the same location.

Using simulation of TPC to determine its performance, and treating it as a baseline.

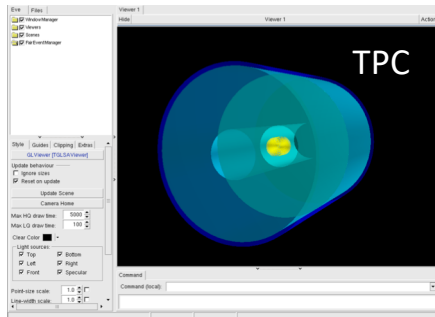
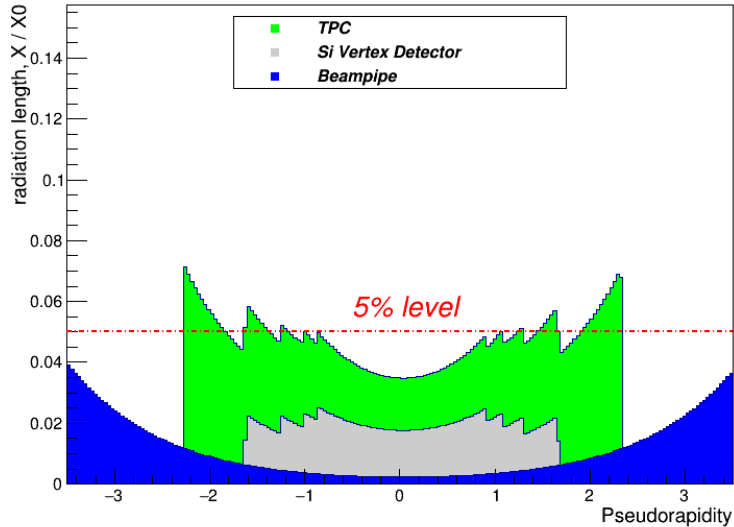
Using a uRWELL tracker with various azimuthal/longitudinal resolution settings (applied when hits are smeared), and determining what resolution is necessary for the uRWELL layers in order to perform comparably to the TPC (or to meet specifications)

Currently studying electrons at 1 and 6 GeV thrown at various values of theta (between 0 and 1 in pseudo-rapidity)



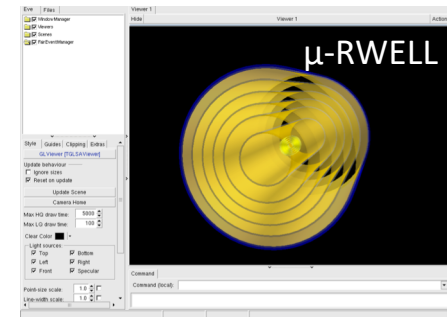
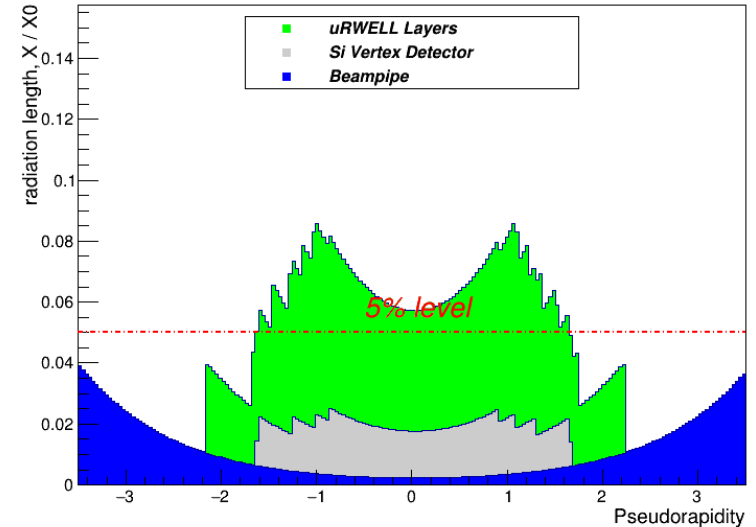
# Radiation Length Plots

EIC Detector Geometry: Radiation Length Scan



(Outer field cage and endcaps removed)

EIC Detector Geometry: Radiation Length Scan



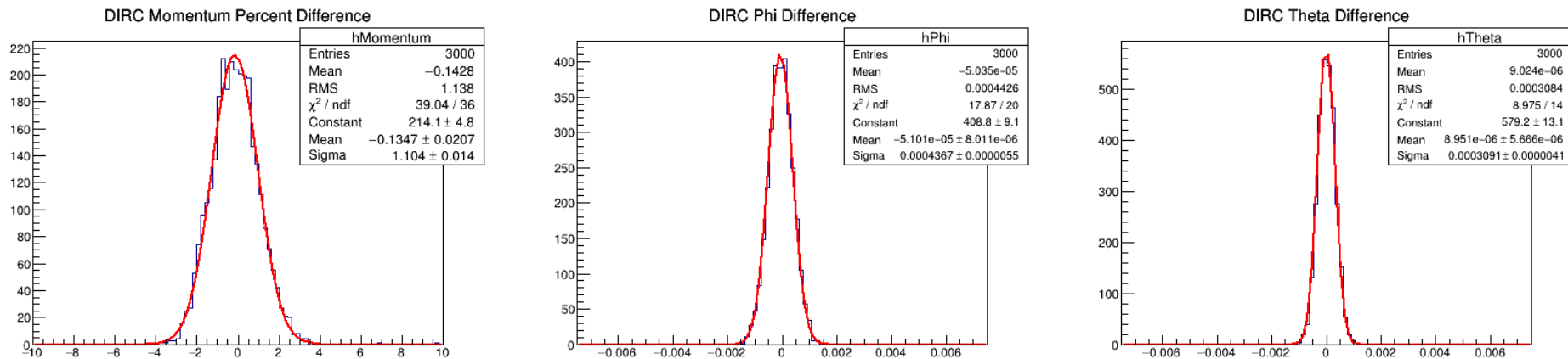
$X/X_0$  based on this:

<https://wiki.bnl.gov/eic/upload/URWELL-Geometery.pdf>

And modified for 200um thick PCB

# Tracking Study - Quantities

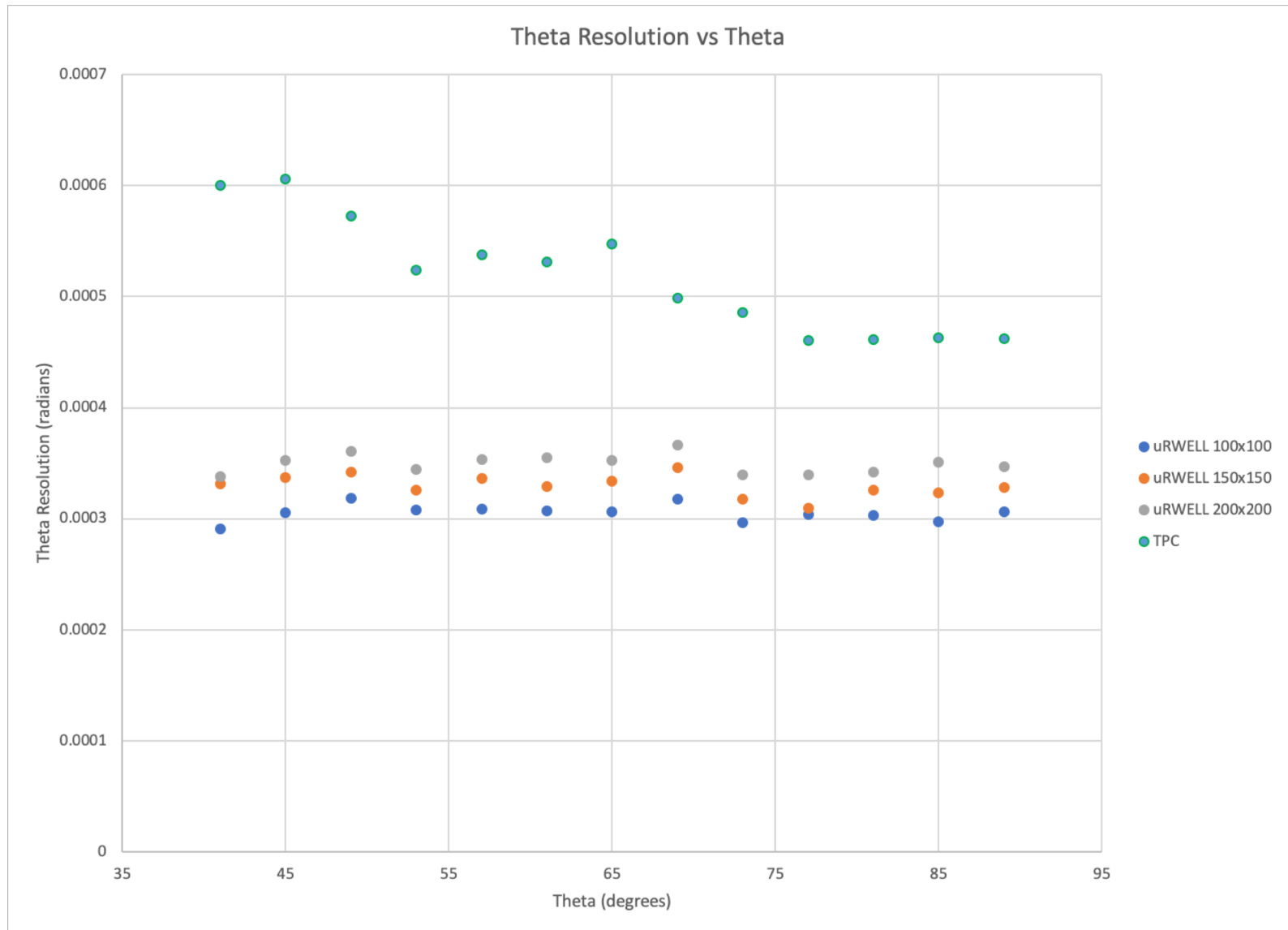
Differences between track parameterization at DIRC radius and true Monte Carlo values



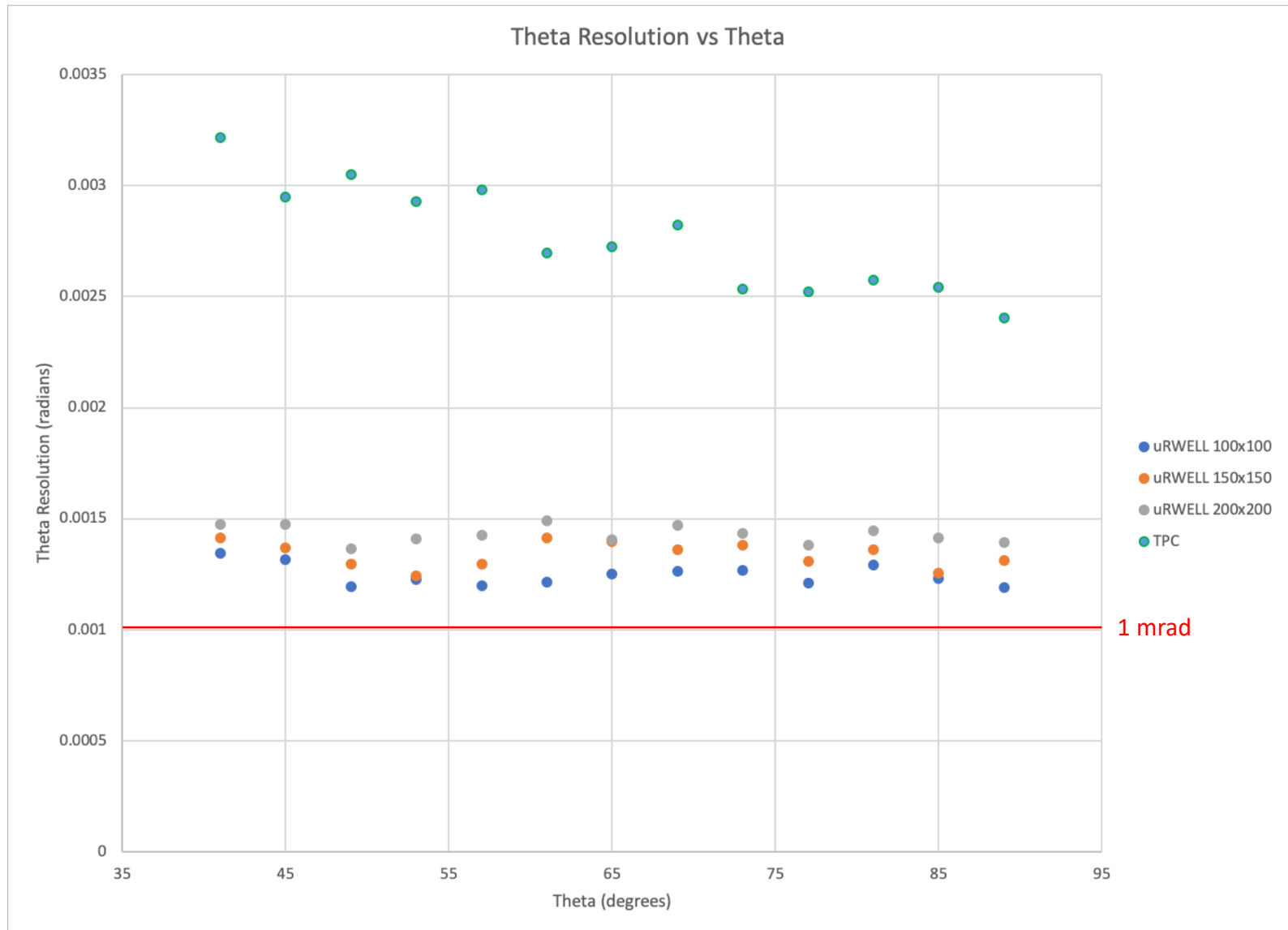
*6 GeV electrons at 65 degrees in uRWELL detector with 100um single point resolution*

Currently looking at the Phi, Theta, and Momentum resolutions at the DIRC radius (and IP)

# Theta Resolution – 6 GeV electrons



# Theta Resolution – 1 GeV electrons



# To Do

- Currently getting more accurate TPC information to use in these simulations
  - Perhaps the TPC will perform better than shown here
- Re-run simulations using pions as well
- Also start looking at  $p_t$  in addition to momentum, theta, and phi resolution.

# Backup Slides



# Details

## GEANT Options

### Processes

○ Pair production, PAIR:	0
○ Compton scattering, COMP:	0
○ Photoelectric effect, PHOT:	0
○ Photofission, PFIS:	0
○ Delta rays, DRAY:	0
○ Annihilation, ANNI:	0
○ Bremsstrahlung, BREM:	0
○ Hadronic processes, HADR:	0
○ Muon nuclear interaction, MUNU:	0
○ Decay, DCAY:	0
○ Energy loss, LOSS:	2
○ Multiple scattering, MULS:	3

### Cuts

○ Gammas, CUTGAM:	1.0E-3	} (GeV)
○ Electrons, CUTELE:	1.0E-3	
○ Neutral hadrons, CUTNEU:	1.0E-3	
○ Charged hadrons, CUTHAD:	1.0E-3	
○ Muons, CUTMUO:	1.0E-3	
○ Electron bremsstrahlung, BCUTE:	1.0E-3	
○ Muon and hadron brems., BCUTM:	1.0E-3	
○ Delta-rays by electrons, DCUTE:	1.0E-3	
○ Delta-rays by muons, DCUTM:	1.0E-3	
○ Direct pair production by muons, PPCUTM:	1.0E-3	
○ Time of flight, TOFMAX:	1.0E10	

## TPC Digitization Details:

55 hits

Transverse Intrinsic Resolution: 200 [um]

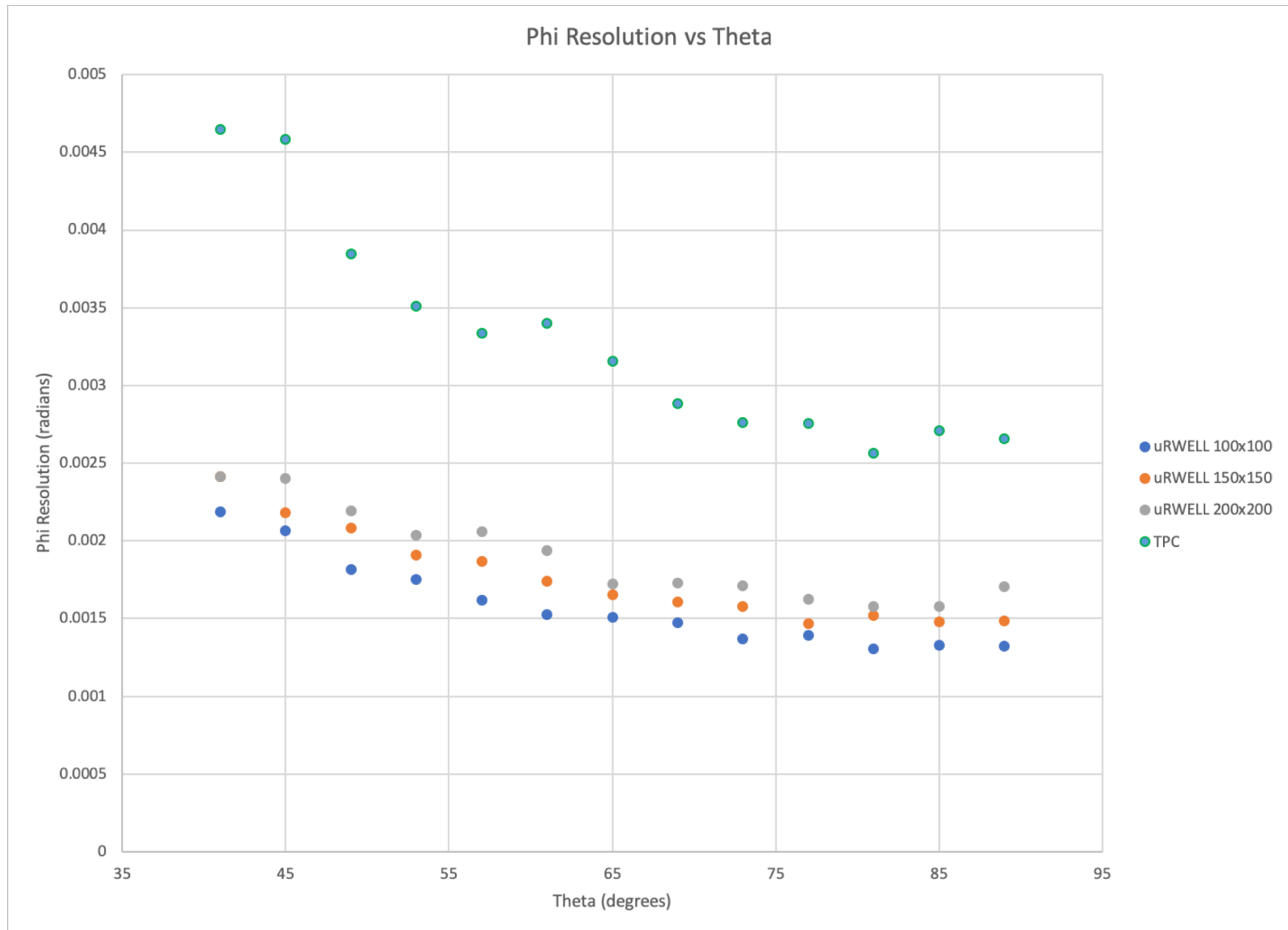
Transverse Dispersion: 15 [um/sqrt(D[cm])]

Longitudinal Intrinsic Resolution: 100 [um]

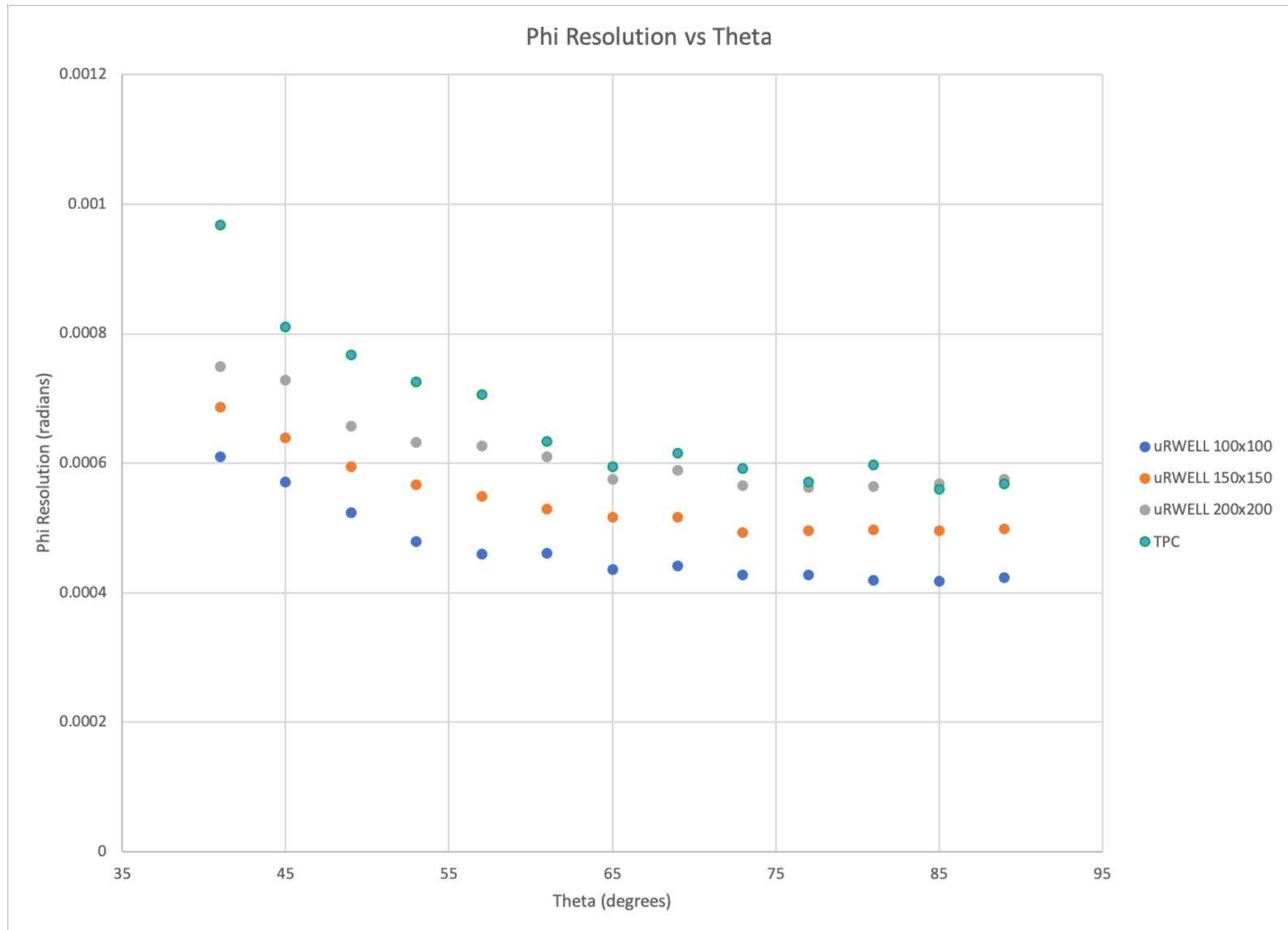
Longitudinal Dispersion: 1 [um/sqrt(D[cm])]

Radial Intrinsic Resolution: 0 [um]

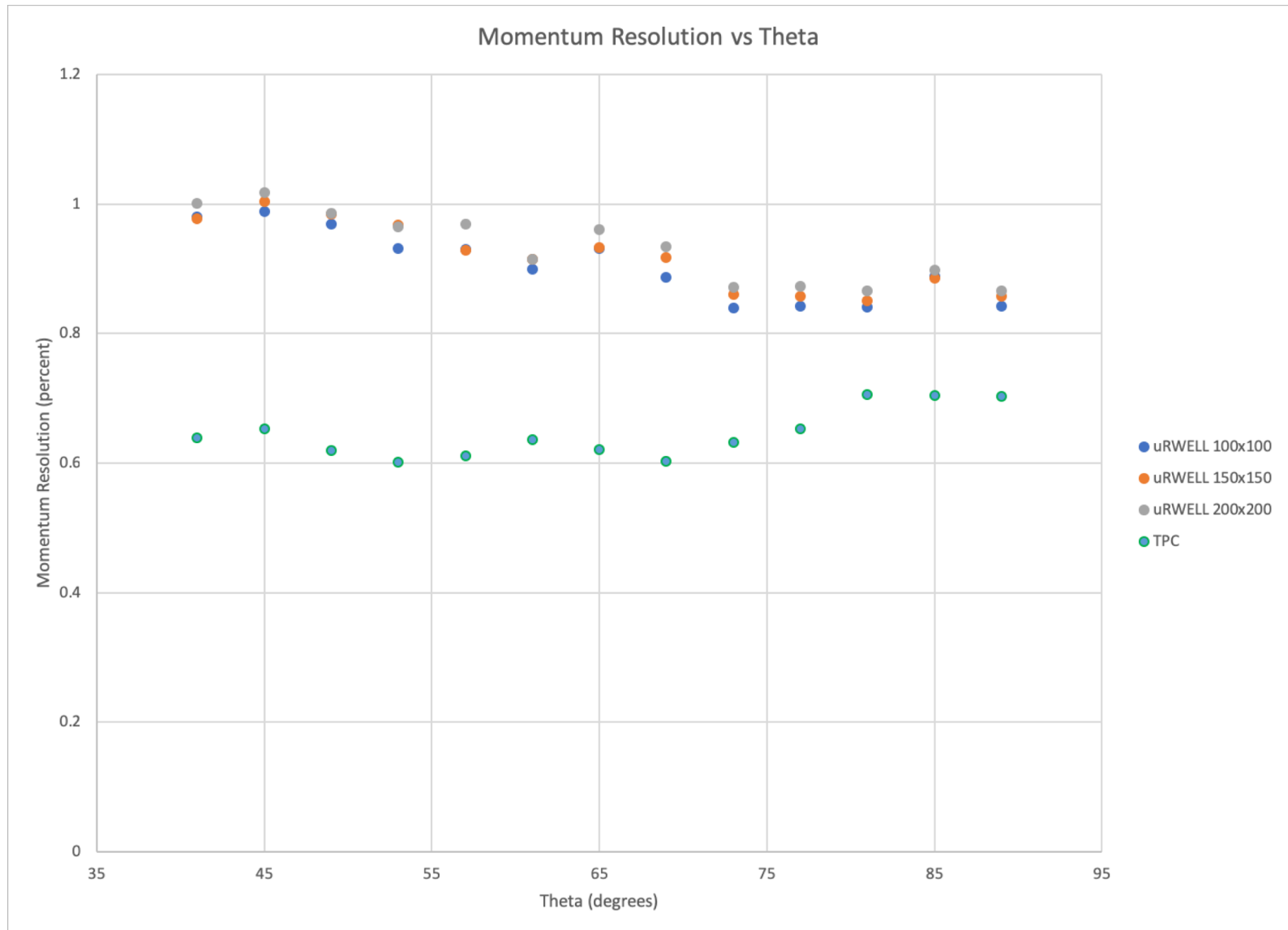
# Phi Resolution – 1 GeV electrons



# Phi Resolution – 6 GeV electrons



# Momentum Resolution – 1 GeV electrons



# Momentum Resolution – 6 GeV electrons

